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## (54) Heating device for the glass washing fluid of motor vehicles and the like.

(57) A heating device for glass washing fluids of motor vehicles substantially consists of one or two plate-like bodies, each having an internal spiral channel. The channel(s) have two communications with the outside, namely an inlet and an outlet, are sealingly closed by a plate of copper or similar good heat conductor, and to the copper plate is superposed or between the plates is arranged as heating element a PTC (Positive Temperature Coefficient) thermistor, connected through a suitable switch to the poles of the vehicle battery, with the eventual interposition of a thermostat, the channel inlet being connected with the duct coming from the washing fluid reservoir provided with a pump, and the channel outlet being connected with the spraying nozzles, so that water enters cold the device inlet and goes out warm from the device outlet. It is also possible to make a chamber in one of the bodies at the point of the inlet, to connect directly the device with a washing fluid suction pump.

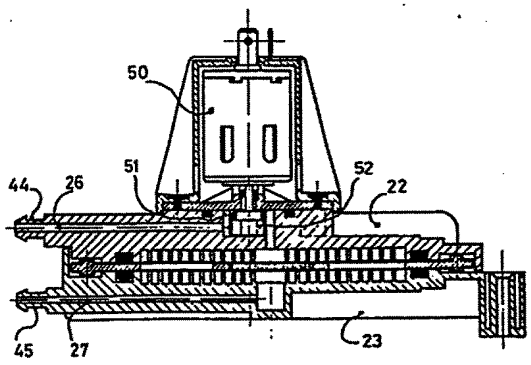


Fig.7

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"HEATING DEVICE FOR THE GLASS WASHING FLUID OF MOTOR VEHICLES AND THE LIKE"

The present invention relates to a heating device for the glass washing fluid used in motor vehicles and like machines.

In order to obtain a sufficient visibility when driving in adverse weather conditions, all motor vehicles are provided at least with a windshield wiper, and often also with a rear window wiper and headlight wipers, and these wipers are generally provided with nozzles spraying a detergent fluid (water or water admixed with detergent liquids).

It is also well known that the present huge development of the private traffic joined with a considerable lack (especially in towns) of indoor parking spaces, compels to leave outdoors the motor vehicles, day and night, and in th cold season it frequently happens that glasses of motor vehicles are found in the morning to be covered with a layer of ice or frost, which has to be removed and to this purpose it is necessary to dissolve it with warm water or to wipe it away with other means.

It has also been noted that, if said glasses of the motor vehicle are cleaned with warm water, cleaning is effected in a much shorter time, is more accurate even when carried out only with the blades of the electric wipers, otherwise in most cases cleaning must be completed by hand, even when using water admixed with detergent

substances.

The object of the present invention is to solve the problem of an efficient and simple cleaning of the glasses of motor vehicles using only the wiper blades and as cleaning fluid, warm water at a temperature of about 40 ÷ 60°C so as to obtain a rapid and complete cleaning and glass defrosting without being compelled to use other means.

The problem is solved by inserting in the circuit going to the nozzles spraying fluid on glasses having blade wipers, a water heating device which has safety features, does not cause damages to itself or to the elements containing it, in case it remains turned on in absence of fluid feed, has a low consumption of electric current and operates in a quick and reliable way.

Such a heating device consists of at least one plate-like body element in which a spiral channel is made, having two communications with the outside, namely an inlet and an outlet, said channel being sealingly closed by a plate cover made of copper or similar good heat conductor, a heating element being externally superposed to said plate and consisting of a PTC (Positive Temperature Coefficient) thermistor, connected through a suitable switch to the two poles of the motor vehicle battery, the channel inlet being connected to the line coming from the washing fluid reservoir provided with a pump, and the channel outlet being connected to the spraying nozzles, so that water enters cold the inlet and goes out warm from the outlet.

Taking indeed advantage of the characteristics of thermistors which, once reached in a very short time the calibrated temperature, hold it indefinitely with a minimum current consumption, the optimal conditions are created, which should be met by such a device, namely: production of water at a predetermined temperature, anyhow the highest temperature compatible with a low consumption of electric current and

maximum reliability of its operation.

The device of the invention will be better understood having recourse to two embodiments given as non-limiting examples only, the first embodiment being provided with one plate only and the second embodiment with two plates, reference being had to the accompanying drawings, in which:

Fig. 1 is a lateral section of the one plate embodiment of the device of the invention;

Fig. 2 is a partially sectioned plan view of said one plate embodiment;

Fig. 3 is a partially sectioned plan view of the two plate embodiment;

Fig. 4 is a cross-sectional view of the two plate embodiment, taken along line A-A of Fig. 3;

Fig. 5 is a cross-sectional view of the two plate embodiment, taken along line B-B of Fig. 3;

Fig. 6 is a sectional detail of the assembling system of the various elements of the two plate embodiment; and

Fig. 7 is a showing of a combined application of the device of the present invention.

With reference now to Figs. 1 and 2, the device according to the present invention consists of a plate-like body 1, made of a poor heat conductor, in which there is a spiral channel 2, provided at its ends with two fittings 3 and 4 putting it in communication with the outside. Said channel 2 is then closed at the top by a plate of a material with a high heat transmission coefficient, such as copper and the like.

Plate 5 is joined to the body 1 so as to make on it a water tight cover, and the channel is therefore acting as a coil; to this end on the body 1, externally to the spiral channel 2, there is a circular groove 6 in which an O-Ring 7 is placed. Above the plate

5, and in close contact with it, there is the power thermistor 8 adapted to reach a temperature allowing that the water flow normally required by the spraying nozzles of a motor vehicle, entering the device at room temperature, goes out from the outlet at a temperature of about 50 ÷ 60°C.

The thermistor is connected at one end at the motor vehicle ground, for instance using for this purpose the hole 11 connecting the device to the structure of said motor vehicle, and at the other end through a switch or similar device (not shown) and the fast-on contact 10 to the positive current line.

A cover 12 made of the same poor heat conductor of body 1 completes the device and is joined to the body by means of riveted pins 13 passing through the conjugate holes 14 peripherally made in cover 12 and the body 1 so as to hold firmly and securedly joined the various elements of the device.

The operation of the device is the following. The device is fixed at a suitable point of the vehicle body in the motor compartment by a bolt passing through the hole 11 so that the contact 9 is connected to the negative circuit (ground) of the electrical equipment; the device is inserted on the fluidic circuit downstream the pump delivering the fluid contained in the reservoir to the spraying nozzles, interrupting the pipe provided for this delivery i.e. connecting fitting 3 with the pipe portion coming from the pump and fitting 4 with the pipe portion going to the nozzles, so that cold water before going to the nozzles enters the fitting 3 and goes out from fitting 4, after having been heated when electric power is supplied to thermistor 8.

In order to make quickier and immediate operation of the device, obtain a more complete employment of the heat produced by the PTC thermistor and improve the operative conditions of it, a second embodiment of the device is provided, having two plates (instead of one), each having its own spiral channel covered by a copper plate,

between which the thermistor is placed, said two channels being series connected, so that the length of the fluid heating path and therefore the quantity of fluid contained in the heating device is doubled.

Moreover, in order to decrease the water heating time at engine starting, it is possible use a thermistor calibrated at a temperature much higher than that of the outgoing water, the latter being then regulated by a thermostat series connected with the thermistor.

Referring now to Figs. 3, 4 and 5, the second embodiment of the device of the invention consists of a body 1 made of a poor heat conductor and divided into two halves 22 and 23, having the shape of a circular plate, each of them being provided with a spiral channel 24 and 25; each of these channels is connected at one end with a fitting duct 26 and 27, respectively (see Fig. 5), each provided in the corresponding circular plate 22 and 23, and putting the relevant channel in communication with the outside.

Each channel 24 and 25 is then closed at the top by a cover 28 and 29, respectively, made of a plate of a material having a high heat transmission coefficient, such as copper and the like.

Plate covers 28 and 29 are joined to each relevant half body 22 and 23, so as to form on each of them a fluid tight seal, and each channel practically forms a coil, and for this purpose in the body halves 22 and 23, externally to the spiral channels 24 and 25, there are two circular grooves 30 and 31 in which corresponding O-Rings 32 and 33 are placed.

The two channels 24 and 25 are connected to one another at their relevant ends opposite to those connected with the fitting pipes 26 and 27, through a hole 34 made at that point in the covers 28 and 29, and fluid seal is obtained through a O-Ring 35

arranged around the holes 34 between the covers 28 and 29.

Between said covers 28 and 29, and in close contact with them, there is the power thermistor 36 calibrated at a rather high temperature so that the quantity of water contained in the device and that normally required by the spraying nozzles of a motor vehicle, may be brought from a temperature of about 5 ÷ 6°C at the inlet, to a temperature of about 50 ÷ 60°C at the outlet in a very short time, for instance of about 20 seconds. In order to hold the covers 28 and 29 in a coplanar position in every part, a spacer 46 is arranged between them.

Thermistor 36 is electrically connected at one side to the vehicle by the fast-on contact 37, and at the other side through a switch or similar device (not shown) and a fast-on contact 38 to the positive current line.

Between thermistor 36 and contact 38 there is a thermostat 39 being in contact with one of the two heat conductive plates or covers 28 and 29, and has a simple safety function, in case the user forgets to turn off the device after its use, in order to avoid that, in absence of water circulation, the water contained in the channels overheats, as the thermistor is calibrated to a much higher temperature for obtaining warm water in a very short time.

The device is completed by the fact that one of the body halves, for instance body half 23 as shown in the figures, has a projecting part 40 provided with three holes 41, 42, 43, for mounting the device with one, two or three bolts or screws in the motor compartment of the vehicle.

Finally the two fitting pipes 26 and 27 connecting the channels 24 and 25 with the outside, are projecting outside each body half 22 and 23 with a protrusion having the from of hose union 44 and 45.

The operation of this embodiment is the following. The device is fixed at a suitable

point of the vehicle body in the motor compartment, be means of bolts or screws passing through one or more of holes 41, 42, 43; the two fast-on contacts 37 and 38 are connected to the electric circuitry of the vehicle; the device is inserted in the washing fluid circuit downstream the pump delivering the fluid contained in the reservoir to the spraying nozzles, cutting the delivery duct and connecting to the two portions so obtained either of the hose unions 44 and 45, for instance union 44 with the duct portion coming from the pump and the other union 45 with the duct portion going to the nozzles, so that cold water before reaching the spraying nozzles enters the device from union 44, flows troughout channel 24, passes through hole 34 made in covers 28 and 29, flows throughout channel 25 and goes out warm from the device outlet union 45, because of heat taken from covers 28 and 29 and therefore from thermistor 36 properly turned on by the user.

It was found that the device of the present invention may bring water contained in it to a temperature of about 50 ÷ 60°C in few seconds with a low current consumption and in case of fortuitous switching on of thermistor, even in absence of water, there is no inconvenience because of the actuation of thermostat 39.

In order to hold assembled the parts of the device so as to form an integral body, rivets 47 are used, passing through conjugated holes 48 made on the peripheral edge of body 1 of the device, as shown in Fig. 6.

The above illustrated embodiments were given as non limiting examples only, as the invention may be practically carried out with many variations which are also falling within the scope of the invention. More particularly, it has to be noted that instead of a thermistor, as a heating element even a normal nickel-chrome plate electric resistance may be used, although this latter system does not achieve the same performance of a PTC thermistor, because the structure of the several elements of

the device contribute to obtaining the results which are the object of the invention.

Finally, with the device of the present invention, with a slight modification of the body or of one of the two body halves, it is possible to make integral also the spraying pump.

To obtain this and as shown in Fig. 7, it is sufficient to make for instance in the body half 22 at the point where the suction pipe 26 is placed, a chamber adapted to receive the impeller 52 of a little pump 50, e.g. of the positive displacement type, so as to enclose in a single compact apparatus both the pump and the heater.

CLAIMS

1) Heating device for the glass washing fluid of motor vehicles and the like, characterized by the fact of consisting of at least one plate like body element (1) in which a spiral channel (2) is made, having two communications with the outside, namely an inlet (3) and an outlet (4) said channel being sealingly closed by a plate cover (5), a heating element being externally superposed to said plate and preferably consisting of a PTC (Positive Temperature Coefficient) thermistor (8), connected through a suitable switch to the two poles of the motor vehicle battery, the channel inlet (3) being connected to the line coming from the washing fluid reservoir provided with a pump, and the channel outlet (4) being connected to the spraying nozzles, so that water enters cold the inlet and goes out warm from the outlet.

2) Heating device according to Claim 1, characterized by the fact that the body (1) consists of two plate-like body halves (22, 23) each having a spiral channel (24, 25) made in it, each channel being provided at one of its ends with a pipe fitting (26, 27) putting in communication with the outside, while the opposite ends of said channels are connected to one another, so that the two channels are series connected, each channel (24, 25) being sealingly closed by a plate cover (28, 29) between which the heating element is placed, consisting of a PTC (Positive Temperature Coefficient) thermistor (36), connected through a suitable switch to the poles of the motor vehicle battery, a thermostat (39) being connected between the thermistor (36) and the electric line, and arranged on one of said plate covers (28, 29), the two pipe fittings (26, 27) being inserted in the washing fluid circuit between the washing fluid reservoir and pump and the spraying nozzles, so that water enters cold the device at one fitting and goes out warm from the other.

3) Heating device according to Claim 1, characterized by the fact that the body (1)

and its cover (12) are made of a poor heat conductor.

4) Heating device according to Claim 2, characterized by the fact that the two body halves (22, 23) are made of a poor heat conductor.

5) Heating device according to Claims 1 and 2, characterized by the fact that the plates (5; 28, 29) covering the spiral channels (2; 24, 25) are made of copper or other good heat conductor.

6) Heating device according to Claim 1, characterized by the fact that the fluid tight seal of the edge of plate (5) is obtained by means of an O-Ring (7) arranged in a groove (6) made in the body (1) externally to the spiral channel (2).

7) Heating device according to Claim 2, characterized by the fact that the fluid tight seal between the channels (24, 25) and the edge of the plates (28, 29) is obtained by means of O-Rings (32, 33) arranged in grooves (30, 31) made in the body halves (22, 23) externally to the spiral channels (24, 25).

8) Heating device according to Claim 2, characterized by the fact that the passage of the washing fluid between the series connected channels (24, 25) of the body halves (22, 23) is obtained through holes (34) made in the plates (28, 29) at the point where are located the conjugate ends of said channels (24, 25) opposite the those connected to the fitting pipes (26, 27), the fluid tight seal in such a point being obtained through an O-Ring (35) placed between the two plates (28, 29) around the holes (34).

9) Heating device according to Claim 2, characterized by the fact that the fitting pipes (26, 27) putting the other end of the channels (24, 25) in communication with the outside are projecting from the corresponding body halves (22, 23) by means of hose unions (44, 45) for their easy connection to the ducts of the delivery circuit of the spraying pump.

10) Heating device according to Claims 1 and 2, characterized by the fact that the

body (1) and its cover (12) or the two body halves (22, 23) and all parts enclosed therebetween, are held assembled together by means of rivets (13, 47) passing through conjugated holes made on the edges of the outer body case of the device.

11) Heating device according to Claims 1 and 2, characterized by the fact that as heating element a normal nickel-chrome plate resistance is used.

12) Heating device according to one or more of the preceding claims, characterized by the fact that a pump (50) may be associated to the device, said pump being connected in the washing fluid suction circuit of the device, in which a chamber (51) is obtained for arranging in it the impeller (52) of said pump (50).

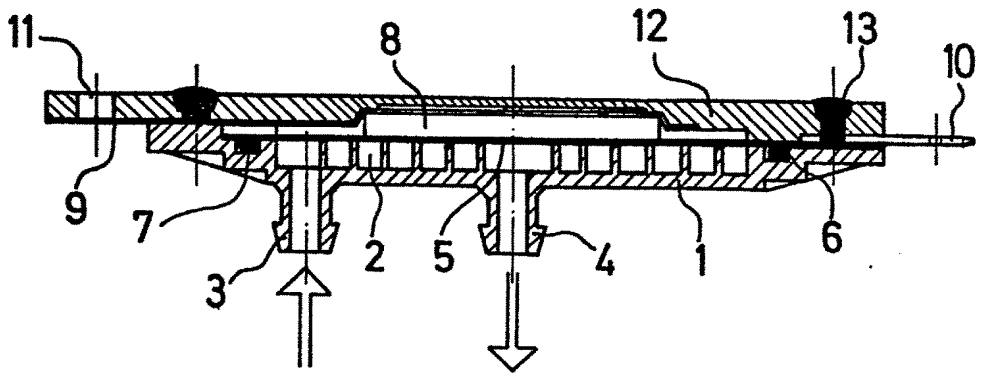


Fig. 1

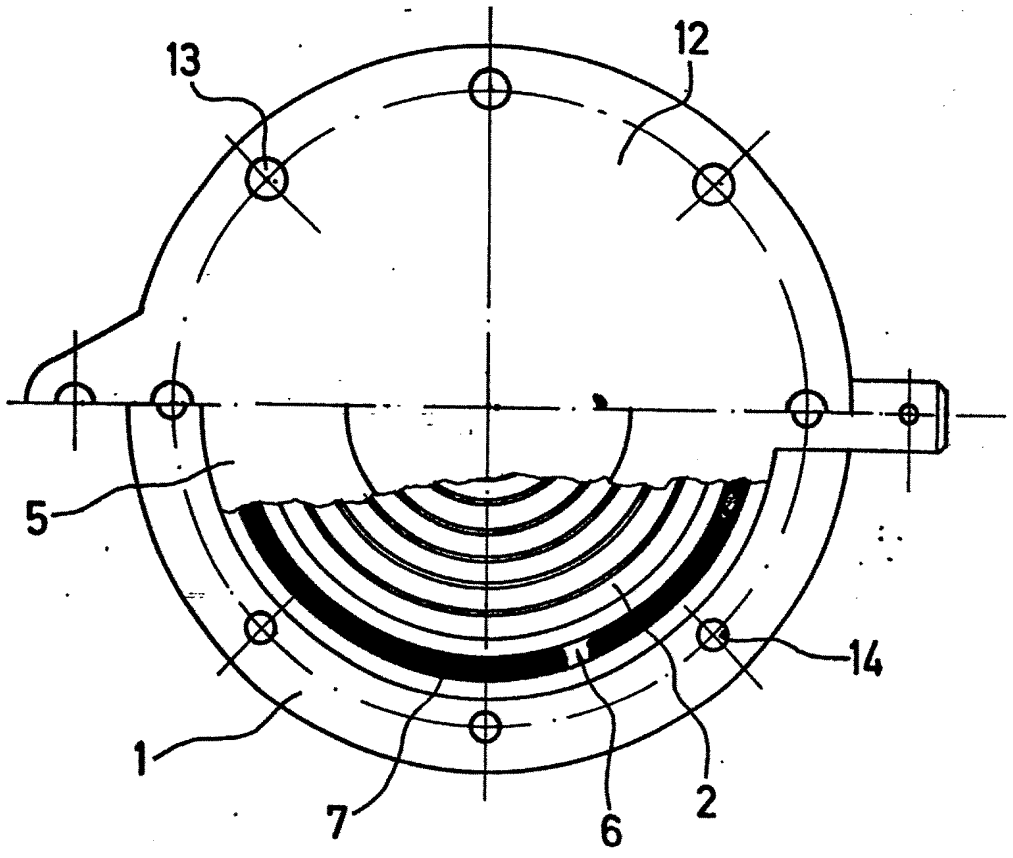


Fig. 2

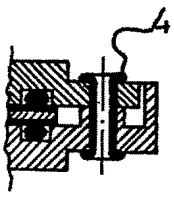


Fig. 6




Fig. 3

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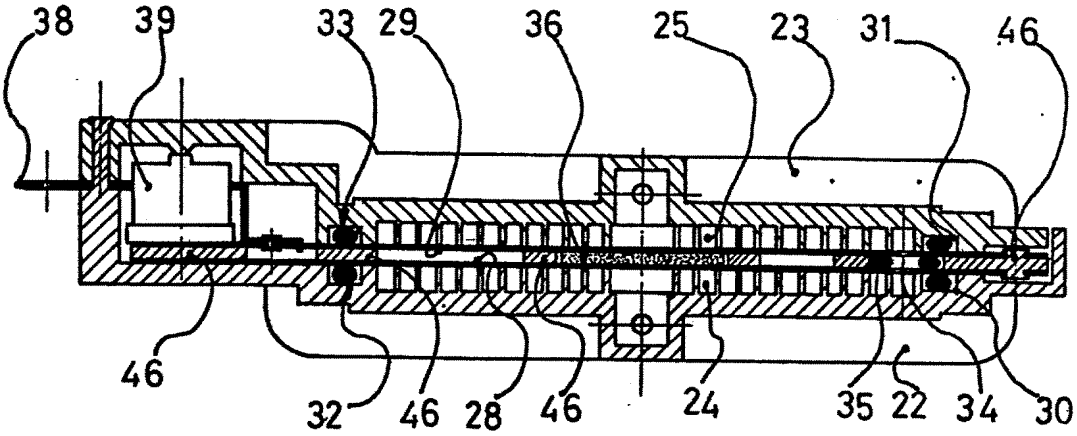


Fig. 4

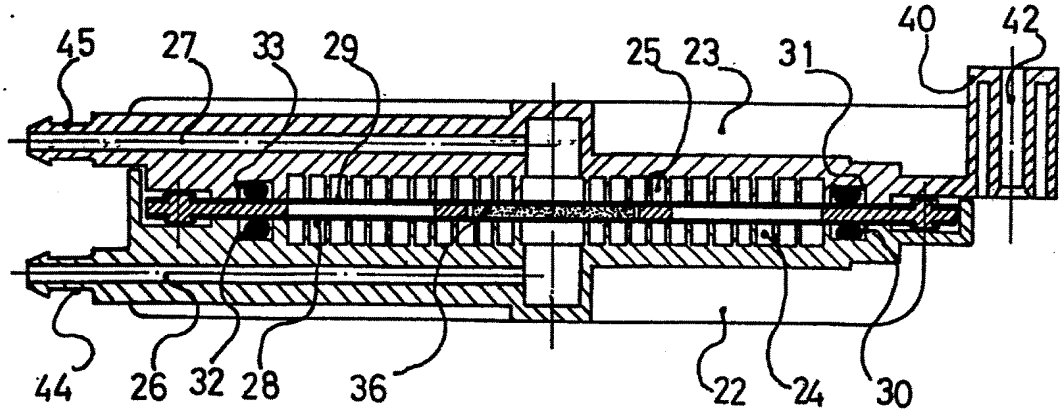


Fig. 5

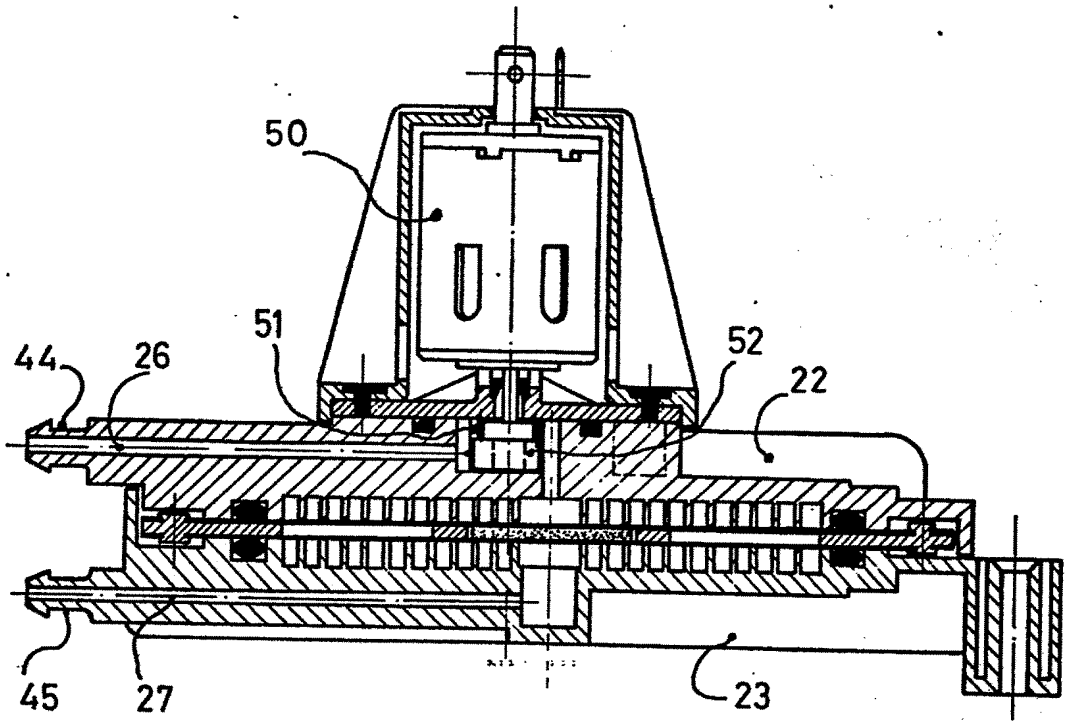


Fig. 7